

1 **Supplementary Materials**

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3 **Estimation of TETRA radio use in the Airwave Health Monitoring**

4 **Study of the British police forces**

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Supplementary Methods

Self-reported usage of personal radio

In both enrolment and clinic-based questionnaires, we asked participants to provide information about their use of TETRA radios: year started using TETRA radios, frequency of usage for the different types of radio (“none of the time”, “some of the time” or “a lot of the time”), number of calls and minutes for the different types of radio during the last shift that they used a TETRA radio, and pool radio usage (proportion of pool radio usage out of total radio usage). Self-reported data were checked for validity and participants reporting inconsistent answers (e.g., reporting not using a personal radio but reporting some calls or minutes for personal radio during their last shift, reporting a year of starting using TETRA radios inconsistent with the year of TETRA roll-out) were classified as unknown for each relevant variable.

To estimate usual personal radio usage from self-reported data, we combined the frequency of usage with the intensity of usage (assessed using tertiles of the self-reported number of calls for personal radio during the last shift) to create categories of low to high usage (Supplementary Table 2). The self-reported number of calls was chosen because we previously found that it was better correlated with objective usage data than the total duration of calls (14).

Imputation process

A summary of the model selection process is provided in Supplementary Figure 2A and 2B. The average of the monthly call durations in the year preceding enrolment was log-transformed because of skewed distribution. Among self-reported personal radio users with objective usual personal radio usage at enrolment available (N=20,473), a test set (N=15,000) and a validation set (n=5,473) were randomly selected. This random selection was repeated 10 times resulting in 10 different test and validations sets. Models were fitted in the test sets and performances were evaluated in the validation sets to obtain valid performance measures. Once the best model was selected based on R^2 and mean squared error values (calculated in the independent

validation sets), this model was used to estimate usual personal radio usage in all self-reported personal radio users. To ensure negligible Monte-Carlo error, 10,000 imputations were performed. The mean of the 10,000 estimations for each participant was used in the present study as a summary statistic to evaluate agreement with objective usual personal radio usage.

Variables were selected as explanatory variables if they were potentially associated with personal radio usage, the misreporting of self-reported data or the missing values themselves. A complete list of variables is provided in Supplementary Table 4. We also used a probabilistic Principal Component Analysis (PCA) to obtain the top two principal components explaining the most variance of the original set of explanatory variables. These top two principal components were included in the model along with the original variables.

Multiple imputation by fully conditional specification did not improve the performance of the imputations for personal radio usage (exploratory analyses not presented) and was therefore not used since it was computationally more expensive

48 **Supplementary Table 1. List of explanatory variables included in our imputation models**

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Variable	Description	Modalities	N (%)
Socio-demographic characteristics			
Sex	Sex of the participant	Men	24422 (73.00)
		Women	9033 (27.00)
Age	Age of the participant when filling the questionnaire	<25 years	1343 (4.00)
		25-29 years	4181 (12.50)
		30-34 years	5838 (17.50)
		35-39 years	6572 (19.60)
		40-44 years	7043 (21.10)
		45-49 years	5618 (16.80)
		50-54 years	2129 (6.40)
		≥55 years	731 (2.20)
Education	Highest degree attained reported in the questionnaire	Postgraduate qualifications	1209 (3.60)
		Bachelor degree or equivalent	5551 (16.60)
		A levels or equivalent	8588 (25.70)
		Vocational qualifications	1882 (5.60)
		GSCE ^{&} , O-Level, CSE [§]	7709 (23.00)
		Left school before taking O level	806 (2.40)
		Missing	7710 (23.00)
Ethnicity	Ethnicity reported in the questionnaire	White	24515 (73.30)
		Other	1222 (3.70)
		Missing	7718 (23.10)
Rank	Rank of participant reported in the questionnaire	Officer	26925 (80.50)
		Staff	3039 (9.10)
		Missing	3491 (10.40)

Seniority	Number of years in current role reported in questionnaire	0-1 year	5934 (17.70)
		2-5 years	11235 (33.60)
		6-9 years	4453 (13.30)
		10-14 years	2347 (7.00)
		≥15 years	1905 (5.70)
		Missing	7581 (22.70)
Years of service	Number of years of service in the current role	1-5 years	6894 (20.60)
		6-10 years	7187 (21.50)
		11-15 years	5251 (15.70)
		16-20 years	3422 (10.20)
		21-30 years	5851 (17.50)
		>30 years	479 (1.40)
Role	Current role reported in questionnaire	Missing	4371 (13.10)
		Beat officer	3931 (11.80)
		Community support officer	1266 (3.80)
		Detective and detective sergeant	3843 (11.50)
		Office duties	749 (2.20)
		Other mobile roles	9213 (27.50)
		Other office based roles	932 (2.80)
		Inspector and chief inspector	893 (2.70)
		Other	1925 (5.80)
Force	Force of the participant when completing the questionnaire	Missing	10703 (32.00)
		Cheshire Constabulary	981 (2.90)
		Devon & Cornwall Police	2096 (6.30)
		Dorset Police	775 (2.30)
		Dumfries & Galloway Police	133 (0.40)
		Dyfed Powys Police	649 (1.90)
		Essex Police	2162 (6.50)

		Grampian Police	523 (1.60)
		Gwent Police	799 (2.40)
		Hampshire police	1533 (4.60)
		Hertfordshire Constabulary	1102 (3.30)
		Lancashire Constabulary	1328 (4.00)
		Leicestershire Constabulary	1303 (3.90)
		Lincolnshire Police	274 (0.80)
		Lothian & Borders	1590 (4.80)
		Merseyside Police	1926 (5.80)
		Metropolitan police	4875 (14.60)
		Norfolk Constabulary	1044 (3.10)
		North Wales Police	884 (2.60)
		Northern Constabulary	133 (0.40)
		South Wales Police	2440 (7.30)
		Staffordshire Police	1161 (3.50)
		Strathclyde Police	2784 (8.30)
		Suffolk Constabulary	813 (2.40)
		Tayside Police	630 (1.90)
		Warwickshire Police	490 (1.50)
		Other	1027 (3.10)
Salary	Personal salary reported in the questionnaire	£44000 +	4522 (13.50)
		£38000 - £43999	5126 (15.30)
		£32000 - £37999	7106 (21.20)
		£26000 - £31999	4924 (14.70)
		£20000 - £25999	2760 (8.20)
		Less than £20000	714 (2.10)
		Missing	8303 (24.80)
Living standard	Satisfaction with living standard reported in the questionnaire	Very dissatisfied	1771 (5.30)
		Moderately dissatisfied	1770 (5.30)

		A little dissatisfied	2624 (7.80)
		No feelings either way	1246 (3.70)
		A little satisfied	1934 (5.80)
		Moderately satisfied	9996 (29.90)
		Very satisfied	5811 (17.40)
		Missing	8303 (24.80)
Marital Status	Marital status reported in the questionnaire	Single	2905 (8.70)
		Separated	741 (2.20)
		Cohabiting	4825 (14.40)
		Married	14979 (44.80)
		Divorce	1127 (3.40)
		Other	575 (1.70)
		Missing	8303 (24.80)
Household	Number of person in the household reported in the questionnaire	1	3544 (10.60)
		2	8007 (23.90)
		3-4	11436 (34.20)
		>4	2165 (6.50)
		Missing	8303 (24.80)
Children	Number of children reported in the questionnaire	0	12046 (36.00)
		1	5164 (15.40)
		2	6276 (18.80)
		>2	1666 (5.00)
		Missing	8303 (24.80)

Physical health status

Hypertension^	Hypertension determined as systolic blood pressure (SBP)>140mmHg or diastolic blood pressure (DBP)>90mmHg (average of three measurements taken during the health screening) or reporting of anti-hypertensive treatment or self-reported antecedent of hypertension in the questionnaire.	Yes	7730 (23.10)
		No	25499 (76.20)
		Missing	226 (0.70)
Body Mass Index ^ (BMI)	BMI calculated as weight / height ² , weight and height measured during the health screening (average of 3 measurements)	Normal weight (BMI<25kg/m ²)	7521 (22.50)
		Overweight (25kg/m ² ≤BMI<30kg/m ²)	12472 (37.30)
		Obese (30kg/m ² ≤BMI)	5287 (15.80)
		Missing	8175 (24.40)
Fat percentage^	Fat percentage measured by Tanita BC-418MA body composition analyser at the health screening	<11%	627 (1.90)
		11-22%	8908 (26.60)
		>22%	14923 (44.60)
		Missing	8997 (26.90)
Abdominal obesity^	Waist circumference measured during the health screening (average of two measurements)	>102cm in men and 88cm in women	4935 (14.80)
		≤102cm in men and 88cm in women	20167 (60.30)
		Missing	8353 (25.00)

High cholesterol^	High cholesterol determined as cholesterol>5 mmol/l (at the health screening) or self-reported diagnosis of high cholesterol or reporting of cholesterol lowering treatment	Yes	15049 (45.00)
		No Missing	10268 (30.70) 8138 (24.30)
Diabetes^	Diabetes determined as HBA1c>6.5% (at the health screening) or reporting of anti-diabetic treatment or self-reported antecedent of diabetes in the questionnaire.	Yes	802 (2.40)
		No Missing	32427 (96.90) 226 (0.70)
Abnormal Electrocardiogram^ (ECG)	Results from the ECG performed at the health screening	Normal	18388 (55.00)
		Borderline normal	5843 (17.50)
		Borderline abnormal	399 (1.20)
		Abnormal Missing	666 (2.00) 8159 (24.40)
Chronic disease	Self-reported diagnosis of stroke, heart attack, angina, chronic liver disease, chronic obstructive pulmonary disease, Parkinson's disease, thyroid-related disorder or cancer	Yes	1005 (3.00)
		No Missing	29144 (87.10) 3306 (9.90)
Sickness leave	Number of sickness leave in the past year reported in the questionnaire	0 day	13766 (41.10)
		1-4 days	8610 (25.70)
		5-9 days	3373 (10.10)
		10-14 days	1467 (4.40)

		≥15 days	2777 (8.30)
		Missing	3462 (10.30)
Visit to GP	Number of visit to the General Practitioner in the past year reported in the questionnaire	0 day	9538 (28.50)
		1-2 days	13962 (41.70)
		3-4 days	4443 (13.30)
		≥5 days	1121 (3.40)
		Missing	4391 (13.10)
Female health status			
Menopausal status	Menopausal status reported in the questionnaire	Male	24422 (73.00)
		Menopausal	296 (0.90)
		Not menopausal	6344 (19.00)
		Missing	2393 (7.20)
Mental health status			
Depression	Depression assessed by the Personal Health Questionnaire Depression Scale PHQ-9	Major depression	680 (2.00)
		Minor depression	1669 (5.00)
		Minimal symptoms	5632 (16.80)
		No depression	16830 (50.30)
		Missing	8644 (25.80)
Anxiety	Anxiety assessed by the subscale of the Hospital anxiety and depression scale	Anxiety Case	1898 (5.70)
		Borderline Case	3257 (9.70)
		Non Anxiety Case	19656 (58.80)
		Missing	8644 (25.80)
Post-traumatic stress disorder (PTSD)	PTSD assessed by a brief screening instrument in the questionnaire	No traumatic event	21819 (65.20)
		Traumatic event	1751 (5.20)

		Missing	9885 (29.50)
Lifestyle			
Sleep	Hours of sleep reported in the questionnaire	5 hours or less	1589 (4.70)
		6 hours	7404 (22.10)
		7 hours	10557 (31.60)
		8 hours	5383 (16.10)
		9 hours or more	892 (2.70)
		Missing	7630 (22.80)
Smoking status	Smoking status reported in the questionnaire	Current	3430 (10.30)
		Former	6909 (20.70)
		Never	22448 (67.10)
		Missing	668 (2.00)
Drinking status	Drinking status reported in the questionnaire	Current light drinker	13317 (39.80)
		Current moderate drinker	8112 (24.20)
		Current heavy drinker without binge drinking	3304 (9.90)
		Current heavy drinker with binge drinking	1839 (5.50)
		Never drinker	711 (2.10)
		Past drinker	1862 (5.60)
		Missing	4310 (12.90)
Red meat	Consumption of red meat reported in the questionnaire	Never	1142 (3.40)
		Less than once a week	6023 (18.00)
		Once a week	8797 (26.30)
		At least twice a week	8960 (26.80)
		More than five times a week	253 (0.80)
		Missing	8280 (24.70)

Fruits and vegetables	Report eating at least 5 portions of fruits and vegetable in the questionnaire	Yes	11156 (33.30)
		No	13531 (40.40)
		Missing	8768 (26.20)
Special diet	Report being on a special diet in the questionnaire	Yes	1611 (4.80)
		No	23564 (70.40)
		Missing	8280 (24.70)
Physical activity	Physical activity reported through the IPAQ questionnaire	Equivalent to 0-59 minutes of moderate physical activity per week	849 (2.50)
		Equivalent to [1-5[hours of moderate physical activity per week	3276 (9.80)
		Equivalent to [5-10[hours of moderate physical activity per week	5050 (15.10)
		Equivalent to [10-15[hours of moderate physical activity per week	4512 (13.50)
		Equivalent to [15-20[hours of moderate physical activity per week	3145 (9.40)
		Equivalent to [20-25[hours of moderate physical activity per week	2388 (7.10)
		Equivalent to [25-30[hours of moderate physical activity per week	1663 (5.00)
		Equivalent to [30-40[hours of moderate physical activity per week	2075 (6.20)
		Equivalent to [40-50[hours of moderate physical activity per week	1164 (3.50)
		Equivalent to ≥50 hours of moderate physical activity per week	886 (2.60)
		Missing	8447 (25.20)
Physical inactivity	Number of hours sitting per week reported in the questionnaire	0-9 hours	1997 (6.00)

		10-14 hours	2701 (8.10)
		15-19 hours	2124 (6.30)
		20-29 hours	5043 (15.10)
		30-39 hours	4845 (14.50)
		40-49 hours	3622 (10.80)
		≥ 50 hours	5034 (15.00)
		Missing	8089 (24.20)
Work environment			
Hard work	Report having to work very hard on a normal working day in the questionnaire	Strongly agree	5141 (15.40)
		Agree	15197 (45.40)
		Disagree	4864 (14.50)
		Strongly disagree	202 (0.60)
		Missing	8051 (24.10)
Excessive work	Report having an excessive amount of work to do on a normal working day in the questionnaire	Strongly agree	4285 (12.80)
		Agree	9506 (28.40)
		Disagree	11256 (33.60)
		Strongly disagree	357 (1.10)
		Missing	8051 (24.10)
Lot to say	Report having a lot to say about what happens on a normal working day in the questionnaire	Strongly agree	1673 (5.00)
		Agree	10384 (31.00)
		Disagree	9779 (29.20)
		Strongly disagree	3566 (10.70)
		Missing	8053 (24.10)
Skill	Report having a high level of skill in the questionnaire	Strongly agree	5293 (15.80)
		Agree	17012 (50.90)

		Disagree	2971 (8.90)
		Strongly disagree	127 (0.40)
		Missing	8052 (24.10)
Freedom	Report having a the freedom to decide how to do his/her work on a normal working day in the questionnaire	Strongly agree	2199 (6.60)
		Agree	13882 (41.50)
		Disagree	7458 (22.30)
		Strongly disagree	1863 (5.60)
		Missing	8053 (24.10)
Creation	Report having a the chance to be creative on a normal working day in the questionnaire	Strongly agree	1736 (5.20)
		Agree	11299 (33.80)
		Disagree	9117 (27.30)
		Strongly disagree	3251 (9.70)
		Missing	8052 (24.10)
Colleague's support	Frequency of colleague support when having difficulty at work reported in the questionnaire	Often	11805 (35.30)
		Sometimes	10664 (31.90)
		Seldom	2109 (6.30)
		Never	233 (0.70)
		Missing	8644 (25.80)
Colleague's listening	Frequency of colleague willing to listen to his/her work related problems reported in the questionnaire	Often	12480 (37.30)
		Sometimes	9969 (29.80)
		Seldom	2072 (6.20)
		Never	290 (0.90)
		Missing	8644 (25.80)

Superior's support	Frequency of immediate superior support when having difficulty at work reported in the questionnaire	Often	8846 (26.40)
		Sometimes	10754 (32.10)
		Seldom	4330 (12.90)
		Never	881 (2.60)
		Missing	8644 (25.80)
Superior's listening	Frequency of immediate superior willing to listen to his/her work related problems reported in the questionnaire	Often	12291 (36.70)
		Sometimes	8671 (25.90)
		Seldom	3112 (9.30)
		Never	737 (2.20)
		Missing	8644 (25.80)
Job satisfaction	Satisfaction with his/her job as a whole reported in the questionnaire	Very satisfied	4878 (14.60)
		Satisfied	15114 (45.20)
		Dissatisfied	3949 (11.80)
		Very dissatisfied	870 (2.60)
		Missing	8644 (25.80)
Part time	Participant report working part time (less than 37 hour per week) in the questionnaire	Yes	2005 (6.00)
		No	27587 (82.50)
		Missing	3863 (11.50)
Overtime	Participant report doing some overtime in the questionnaire	No	11635 (34.80)
		less than 6h	13171 (39.40)
		6h and more	4757 (14.20)
		Missing	3892 (11.60)

Night shift	Participant report having work at night in the past 72hours	Yes	2263 (6.80)
		No	17008 (50.80)
		Missing	14184 (42.40)
Personal radio usage			
Usual usage	Usual usage of personal radio reported in the questionnaire	Some of the time	7918 (23.70)
Analogue radio	Participant report still using the old analogue radio in the questionnaire	All of the time	25537 (76.30)
		Yes	22357 (66.80)
		No	7688 (23.00)
		Missing	3410 (10.20)
Duration	number of years since starting using any TETRA radio reported in the questionnaire	<1	935 (2.80)
		1	3154 (9.40)
		2	4663 (13.90)
		3	4491 (13.40)
		4	5201 (15.50)
		5	3545 (10.60)
		6	2590 (7.70)
		7	2354 (7.00)
		≥8	4190 (12.50)
		Missing	2332 (7.00)
Last shift	Type of the last shift when the participant used a TETRA radio	Early morning shift (starts between 6am and 6.59am and ends by 6pm)	945 (2.80)
		Morning shift (starts between 7am and 6pm and ends by 6pm)	11751 (35.10)
		Evening shift (ends after 6pm and before midnight)	8141 (24.30)
		Night shift (includes a period of work between midnight and 6am)	8170 (24.40)

Shift duration	Duration of the last shift when the participant used a TETRA radio	Missing	4448 (13.30)
		<7 hours	1069 (3.20)
		7-8.9 hours	10247 (30.60)
		9-10.9 hours	13657 (40.80)
		≥11 hours	4009 (12.00)
Daily calls	Number of call of personal radio during the last shift reported in the questionnaire	Missing	4473 (13.40)
		0 call	4609 (13.80)
		1-4 calls	7780 (23.30)
		5-9 calls	5215 (15.60)
		10-14 calls	4515 (13.50)
		15-19 calls	1762 (5.30)
		20-29 calls	3108 (9.30)
		30-39 calls	1191 (3.60)
		40-49 calls	594 (1.80)
		≥50 calls	1020 (3.00)
		Missing	3661 (10.90)
Daily minutes	Total duration of calls of personal radio during the last shift reported in the questionnaire	0 minutes	4516 (13.50)
		1-4 minutes	10086 (30.10)
		5-9 minutes	5116 (15.30)
		10-19 minutes	5220 (15.60)
		20-29 minutes	1837 (5.50)
		30-39 minutes	1240 (3.70)
		40-49 minutes	519 (1.60)
		50-99 minutes	1024 (3.10)
		≥100 minutes	469 (1.40)
		Missing	3428 (10.20)
		0 call	2360 (7.10)

Weekly calls		1-3 calls	2997 (9.00)
		4-6 calls	2109 (6.30)
		7-10 calls	1366 (4.10)
		11-19 calls	1158 (3.50)
		20-49 calls	469 (1.40)
		≥50 calls	107 (0.30)
		Missing	22889 (68.40)
Weekly minutes		0 minute	2225 (6.70)
		1-3 minutes	3523 (10.50)
		4-6 minutes	1979 (5.90)
		7-10 minutes	718 (2.10)
		11-19 minutes	753 (2.30)
		20-49 minutes	360 (1.10)
		≥50 minutes	206 (0.60)
		Missing	23691 (70.80)
Usage of other radio types			
Desk mounted radio	Usage status of desk mounted radio reported in the questionnaire	Infrequent user	5263 (15.70)
		Frequent user but did not report any call during the last shift	409 (1.20)
		Frequent user and reported some call during the last shift	589 (1.80)
		Non-user	27033 (80.80)
		Missing	161 (0.50)
Motorbike mounted radio	Usage status of motorbike mounted radio reported in the questionnaire	Infrequent user	487 (1.50)
		Frequent user	300 (0.90)
		Non-user	32413 (96.90)
		Missing	255 (0.80)

Covert radio	Usage status of covert radio reported in the questionnaire	Infrequent user	4477 (13.40)
		Frequent user but did not report any call during the last shift	929 (2.80)
		Frequent user and reported some call during the last shift	1007 (3.00)
		Non-user	26919 (80.50)
		Missing	123 (0.40)
Car mounted	Usage status of car mounted radio reported in the questionnaire	Infrequent user	16198 (48.40)
		Frequent user but did not report any call during the last shift	1102 (3.30)
		Frequent user and reported some call during the last shift	3055 (9.10)
		Non-user	12905 (38.60)
		Missing	195 (0.60)
Pool radio	Report using pool radios in the questionnaire (>0% of total TETRA radio usage)	Yes	4331 (12.90)
		No	24552 (73.40)
		Missing	4572 (13.70)
Control room	Report work in control room in the questionnaire	Yes	5411 (16.20)
		No	24690 (73.80)
		Missing	3354 (10.00)
Cover radio calls	Number of call of covert radio during the last shift reported in the questionnaire	0 call	25250 (75.50)
		1-4 calls	444 (1.30)
		5-9 calls	319 (1.00)
		10-14 calls	270 (0.80)
		15-29 calls	294 (0.90)

		≥30 calls	240 (0.70)
		Missing	6638 (19.80)
Pool radio calls	Number of call of pool radio during the last shift reported in the questionnaire	0 call	26780 (80.00)
		1-4 calls	576 (1.70)
		5-9 calls	246 (0.70)
		10-14 calls	180 (0.50)
		≥15 calls	213 (0.60)
		Missing	5460 (16.30)
Desk mounted radio calls	Number of call of desk mounted radio during the last shift reported in the questionnaire	0 call	25084 (75.00)
		1-4 calls	912 (2.70)
		5-9 calls	285 (0.90)
		10-14 calls	169 (0.50)
		≥15 calls	326 (1.00)
		Missing	6679 (20.00)
Vehicle mounted radio calls	Number of call of vehicle mounted radio during the last shift reported in the questionnaire	0 call	20278 (60.60)
		1-4 calls	3378 (10.10)
		5-9 calls	1748 (5.20)
		10-14 calls	1221 (3.60)
		15-19 calls	309 (0.90)
		20-29 calls	497 (1.50)
		30-39 calls	182 (0.50)
		≥40 calls	331 (1.00)
		Missing	5511 (16.50)
Minutes of covert radio	Total duration of calls of covert radio during the last shift reported in the questionnaire	0 minute	25508 (76.20)

		1-4 calls	599 (1.80)
		5-9 calls	310 (0.90)
		10-19 calls	293 (0.90)
		20-39 calls	196 (0.60)
		≥40 calls	172 (0.50)
		Missing	6377 (19.10)
Minutes of pool radio	Total duration of calls of covert radio during the last shift reported in the questionnaire	0 minute	26991 (80.70)
		1-4 minutes	698 (2.10)
		5-9 minutes	232 (0.70)
		10-19 minutes	204 (0.60)
		≥20 minutes	148 (0.40)
		Missing	5182 (15.50)
Minutes of desk mounted radio	Total duration of calls of covert radio during the last shift reported in the questionnaire	0 minute	25376 (75.90)
		1-4 minutes	889 (2.70)
		5-9 minutes	236 (0.70)
		10-19 minutes	200 (0.60)
		≥20 minutes	340 (1.00)
		Missing	6414 (19.20)
Minutes of vehicle mounted radio	Total duration of calls of covert radio during the last shift reported in the questionnaire	0 minute	20719 (61.90)
		1-4 minutes	3966 (11.90)
		5-9 minutes	1474 (4.40)
		10-19 minutes	1150 (3.40)
		20-29 minutes	316 (0.90)
		30-39 minutes	216 (0.60)
		≥40 minutes	358 (1.10)
		Missing	5256 (15.70)

Seasonality

Years	Year that the questionnaire was filled in	2004	1350 (4.00)
		2005	1201 (3.60)
		2006	3055 (9.10)
		2007	3817 (11.40)
		2008	3809 (11.40)
		2009	4178 (12.50)
		2010	4737 (14.20)
		2011	2626 (7.80)
		2012	2122 (6.30)
		2013	2860 (8.50)
		2014	2795 (8.40)
		2015	905 (2.70)
Month	Month that the questionnaire was filled in	January	2520 (7.50)
		February	3004 (9.00)
		March	2947 (8.80)
		April	2208 (6.60)
		May	2909 (8.70)
		June	3239 (9.70)
		July	2641 (7.90)
		August	2453 (7.30)
		September	3056 (9.10)
		October	3076 (9.20)
		November	3278 (9.80)
		December	2124 (6.30)
Day	Day of the week that the questionnaire was filled in	Monday	8375 (25.00)
		Tuesday	7840 (23.40)
		Wednesday	8057 (24.10)
		Thursday	7212 (21.60)
		Friday	1096 (3.30)

		Weekend	875 (2.60)
Symptoms			
Headache (radio)	Report in the questionnaire having headache, while using and shortly after using the radio	Yes	2433 (7.30)
		No	30796 (92.10)
		Missing	226 (0.70)
Warm (radio)	Report in the questionnaire having a warming sensation on the face or a burning sensation in the ear, while using and shortly after using the radio	Yes	2701 (8.10)
		No	30528 (91.30)
		Missing	226 (0.70)
Other symptoms (radio)	Report in the questionnaire having any other symptoms, while using and shortly after using the radio	Yes	1845 (5.50)
		No	31384 (93.80)
		Missing	226 (0.70)
Headache (mobile)	Report in the questionnaire having headache, while using and shortly after using the mobile phone	Yes	683 (2.00)
		No	30043 (89.80)
		Missing	2729 (8.20)
Warm (mobile)	Report in the questionnaire having a warming sensation on the face or a burning sensation in the ear, while using and shortly after using the mobile phone	Yes	4394 (13.10)
		No	26332 (78.70)
		Missing	2729 (8.20)

Other symptoms (mobile)	Report in the questionnaire having any other symptoms, while using and shortly after using the mobile phone	Yes	984 (2.90)
		No	29742 (88.90)
		Missing	2729 (8.20)

Other variables

Mobile phone	Participant report using a mobile phone in the questionnaire	Yes	32786 (98.00)
		No	405 (1.20)
		Missing	264 (0.80)

50 & GCSE, General Certificate of Secondary Education

51 \$ CSE, Certificate of Secondary Education

52 ^ Variables available only for participants who attended the clinical assessment

53 **Supplementary Table 2. Categorisation of personal radio (PR) usage according to self-reported data (N=50,318)**

TETRA user ¹	No	Yes							
PR user ¹		No	Yes						Unknown
Frequency of PR usage ¹			Some	A lot				Unknown	
PR usage tertiles ²				1	2	3	Unknown		
PR usage status	Non user	Non user	Low	Low	Medium	High	Unknown (excluded)	Unknown (excluded)	Unknown (excluded)
N	15456	1392	7918	7907	7524	7720	2373	13	15

¹ Self-reported

² Tertiles calculated using self-reported personal radio usage (number of calls) during the last shift.

54

55 **Supplementary Table 3. Characteristics of personal radio users according to the availability of data on objective usage at enrolment**
56 **(N=33,788)**

	Objective personal radio usage missing	Objective personal radio usage available	P
Total (%)	12339 (36.5)	21449 (63.5)	
Gender (%)			0.24
Women	3290 (36.0)	5846 (64.0)	
Men	9049 (36.7)	15603 (63.3)	
Rank (%)			<0.0001
Officer	9516 (35.0)	17684 (65.0)	
Staff	1436 (48.1)	1550 (51.9)	
Missing	1387 (38.5)	2215 (61.5)	
Education (%)			<0.0001
Left school before taking GCSEs	307 (38.0)	501 (62.0)	
GCSE or equivalent	2512 (32.3)	5269 (67.7)	
Vocational qualifications	654 (34.8)	1228 (65.2)	
A levels or equivalent	2902 (33.7)	5704 (66.3)	
Bachelor degree or equivalent	1945 (34.8)	3643 (65.2)	
Postgraduate qualifications	505 (41.9)	700 (58.1)	
Missing	3514 (44.4)	4404 (55.6)	
Smoking status (%)			<0.0001
Current smoker	1333 (38.7)	2111 (61.3)	
Past smoker	2653 (38.1)	4315 (61.9)	
Non-smoker	8139 (35.9)	14549 (64.1)	
Missing	214 (31.1)	474 (68.9)	
Age (%)			<0.0001
<30 years	1730 (31.2)	3814 (68.8)	
31-40 years	4466 (35.7)	8033 (64.3)	
41-50 years	4776 (37.1)	8086 (62.9)	
≥50 years	1367 (47.4)	1516 (52.6)	

Self-reported frequency of personal radio usage (%)			<0.0001
Some of the time	3741 (49.4)	3826 (50.6)	
A lot of the time	8582 (34.0)	16641 (66.0)	
Missing	16 (1.6)	982 (98.4)	
<i>GCSEs: General Certificate of Secondary Education</i>			

58 **Supplementary Table 4. Performance of imputation models by method: Average of R^2 and mean squared error in the 10 validation sets**
59

	R^2	Mean squared error
Ensemble methods		
Random Forest	0.43	1.86
Gradient Boosting Regressor	0.46	1.77
Bagging Regressor	0.44	1.83
Extra Trees Regressor	0.44	2.02
Support Vector Machine learning techniques		
Epsilon-Support Vector Regression	0.41	1.95
Linear-Support Vector Regression	0.43	1.87
Linear models		
Ordinary least squares Linear Regression	0.45	1.81
Ridge regression	0.45	1.80
Bayesian Ridge regression	0.45	1.80

60

Supplementary Table 5. Force-specific data availability and correlation between objective and imputed data in users with objective data

	All		Personal radio users				
	N (column %)	Clinical assessment, N (column %)	N (column %)	Objective data available, N (column %)	Imputed, N (column %)	% with objective data	Correlation between objective and imputed data
Force/Agency							
Avon & Somerset	9 (0.02)	9(0.02)	6 (0.02)		6 (0.05)		
Bedfordshire	3 (0.01)	3(0.01)	1 (0)		1 (0.01)		
Central Scotland	175 (0.35)	2(0.01)	163 (0.48)		163 (1.32)		
Cheshire	1790 (3.56)	1491(3.91)	974 (2.88)	905 (4.22)	69 (0.56)	92.9	0.70
CRO	1 (0)						
Cumbria	1 (0)	1(0)					
Derbyshire	1 (0)	1(0)	1 (0)		1 (0.01)		
Devon & Cornwall	3121 (6.20)	2575(6.76)	2110 (6.24)	1936 (9.03)	174 (1.41)	91.8	0.73
Dorset	1260 (2.50)	919(2.41)	756 (2.24)	712 (3.32)	44 (0.36)	94.2	0.78
Dumfries & Galloway	165 (0.33)		134 (0.40)	98 (0.46)	36 (0.29)	73.1	0.37
Dyfed-Powys	1002 (1.99)	924(2.42)	655 (1.94)	549 (2.56)	106 (0.86)	83.8	0.68
Essex	3092 (6.14)	2809(7.37)	2170 (6.42)	1706 (7.95)	464 (3.76)	78.6	0.70
Fife	127 (0.25)		107 (0.32)		107 (0.87)		
Grampian	780 (1.55)	546(1.43)	508 (1.50)	421 (1.96)	87 (0.71)	82.9	0.65
Gwent	1273 (2.53)	1147(3.01)	822 (2.43)	681 (3.17)	141 (1.14)	82.8	0.66
Hampshire	2224 (4.42)	908(2.38)	1583 (4.69)	589 (2.75)	994 (8.06)	37.2	0.65
Hertfordshire	1663 (3.30)	1403(3.68)	1101 (3.26)	1045 (4.87)	56 (0.45)	94.9	0.79
Lancashire	2089 (4.15)		1385 (4.10)	1224 (5.71)	152 (1.23)	88.4	0.40
Leicestershire	1606 (3.19)	1352(3.55)	1301 (3.85)	1213 (5.66)	88 (0.71)	93.2	0.71
Lincolnshire	364 (0.72)		281 (0.83)	204 (0.95)	76 (0.62)	72.6	0.50
Lothian & Borders	2151 (4.27)	1927(5.06)	1590 (4.71)	822 (3.83)	768 (6.23)	51.7	0.57
Merseyside	3104 (6.17)	2894(7.59)	1979 (5.86)	1838 (8.57)	141 (1.14)	92.9	0.74
Metropolitan police	8322 (16.54)	7942(20.84)	4873 (14.42)	221 (1.03)	4652 (37.73)	4.5	0.47
MOD	1 (0)	1(0)	1 (0)		1 (0.01)		
Norfolk	1699 (3.38)	1422(3.73)	1055 (3.12)	877 (4.09)	178 (1.44)	83.1	0.69
North Wales	1431 (2.84)	1124(2.95)	923 (2.73)	846 (3.94)	77 (0.62)	91.7	0.74

Northamptonshire	1 (0)		1 (0)		1 (0.01)		
Northern	164 (0.33)	1(0)	133 (0.39)	85 (0.40)	48 (0.39)	63.9	0.29
Scottish CDEA	1 (0)	1(0)	1 (0)		1 (0.01)		
Scottish CRO	1 (0)	1(0)	1 (0)		1 (0.01)		
South Wales	3601 (7.16)	1818(4.77)	2501 (7.40)	1741 (8.12)	760 (6.16)	69.6	0.67
Staffordshire	1791 (3.56)	1523(4)	1171 (3.47)	1134 (5.29)	37 (0.3)	96.8	0.74
Strathclyde	3282 (6.52)	2812(7.38)	2784 (8.24)	1043 (4.86)	1741 (14.12)	37.5	0.57
Suffolk	1150 (2.29)	925(2.43)	813 (2.41)	536 (2.50)	277 (2.25)	65.9	0.65
Tayside	886 (1.76)	729(1.91)	636 (1.88)	532 (2.48)	104 (0.84)	83.6	0.63
West Midlands	686 (1.36)	5(0.01)	429 (1.27)		429 (3.48)		
Warwickshire	858 (1.71)	712(1.87)	523 (1.55)	491 (2.29)	32 (0.26)	93.9	0.76
West Mercia	2 (0)	2(0.01)	2 (0.01)		2 (0.02)		
SOCA	278 (0.55)	116(0.3)	231 (0.68)		231 (1.87)		
SPSA	39 (0.08)	35(0.09)	15 (0.04)		15 (0.12)		
Port of Tilbury	4 (0.01)	4(0.01)	4 (0.01)		4 (0.03)		
Home office	3 (0.01)	3(0.01)					
Scottish police federation	1 (0)	1(0)					
SOCA Scotland	70 (0.14)		47 (0.14)		47 (0.38)		
Other	46 (0.09)	18(0.05)	17 (0.05)				
Total:	50318	38106	33788	21449	12329		

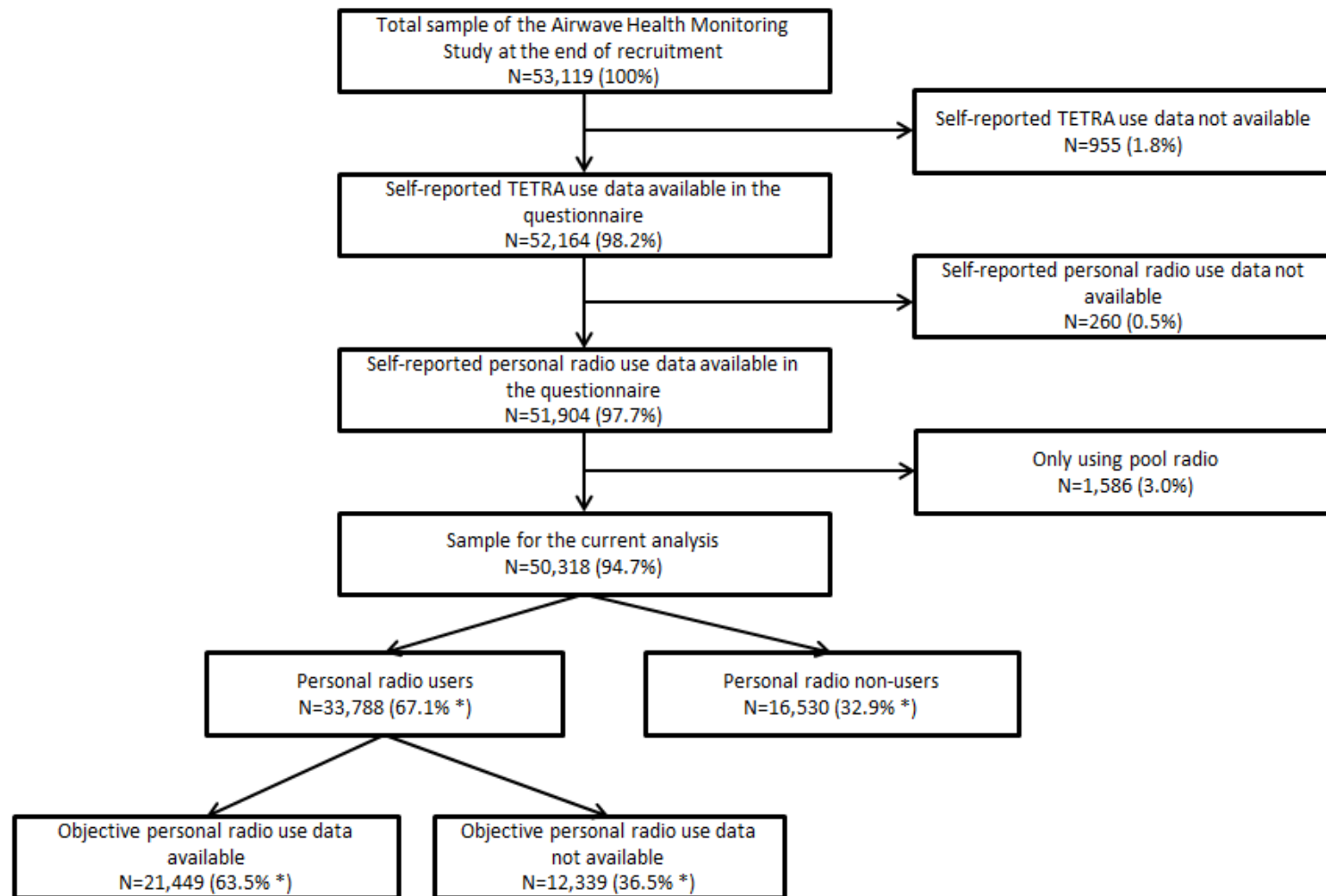
62 CRO, Criminal Record Office; MOD, Ministry of Defence police; CDEA, Crime and Drugs Enforcement Agency; SOCA, Serious Organised Crime Agency; SPSA,

63 Scottish Police Service Authority

64

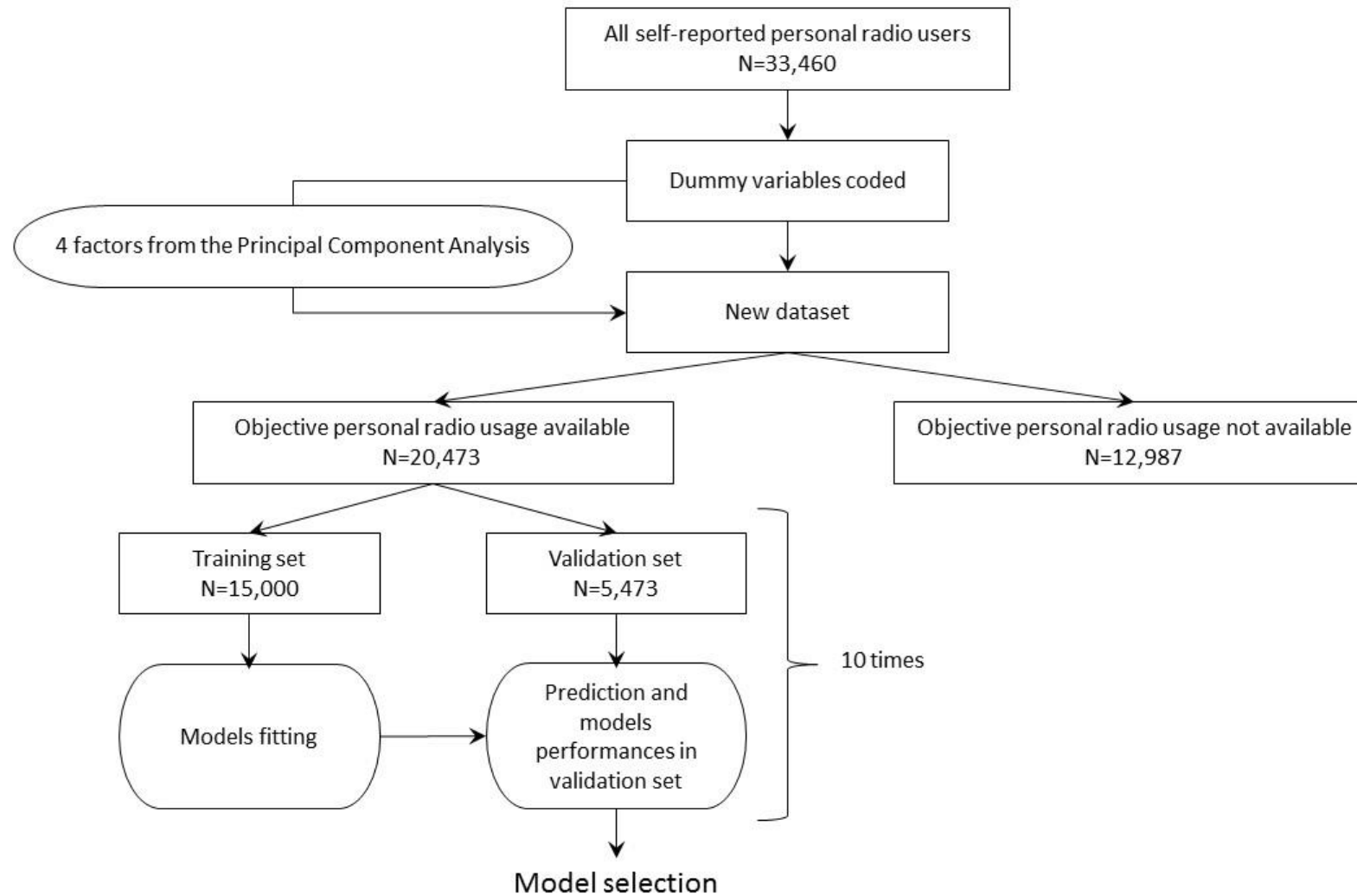
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66 **Supplementary Figure 1**



* The proportion is with respect to the parent sample

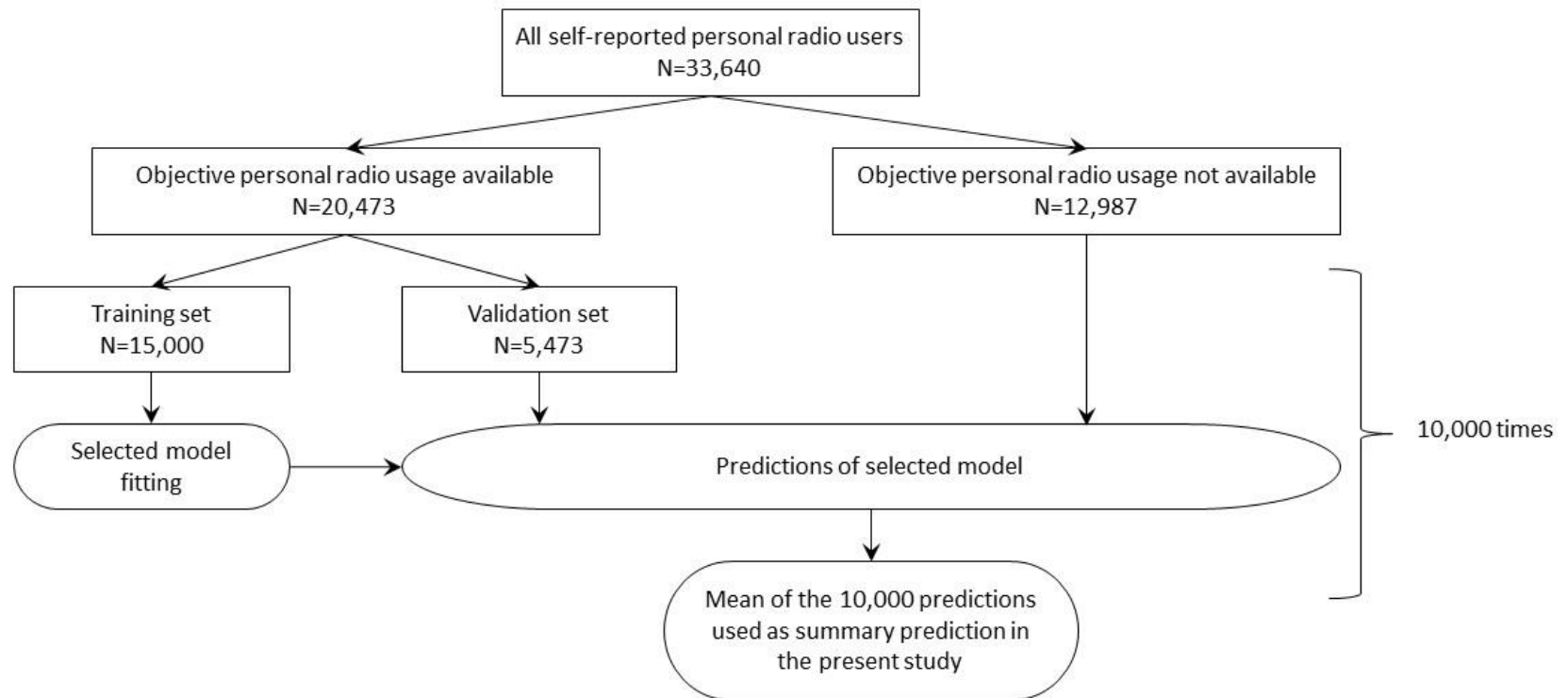
68 **Supplementary Figure 2A. Summary of the imputation model selection process - step 1: model selection**



69

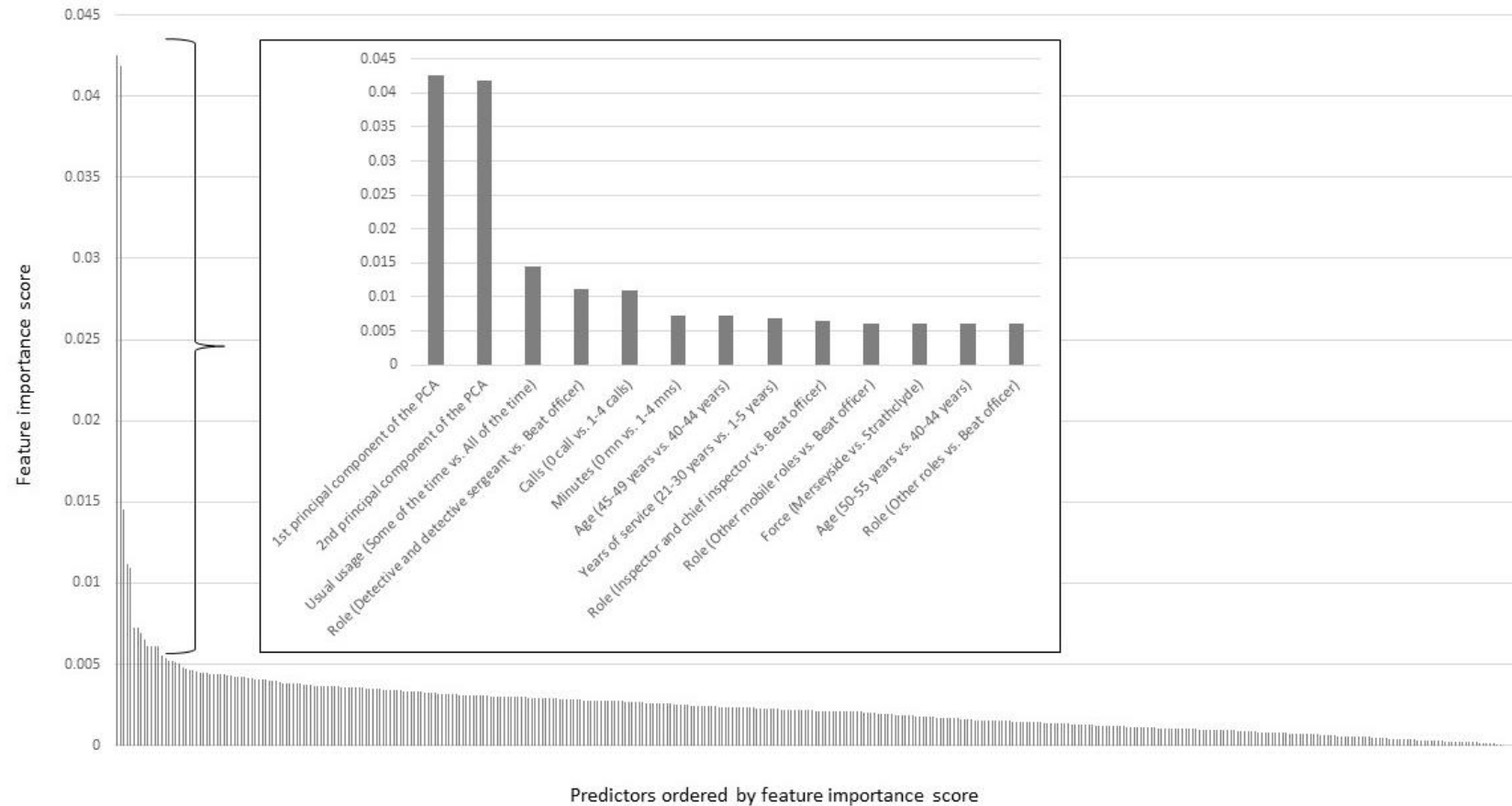
70

71 **Supplementary Figure 2B. Summary of the imputation model selection process - step 2: imputations for selected model**



72

73 **Supplementary Figure 3A. Feature importance for each individual dichotomous predictor in the gradient boosting regressor model**
 74 **estimating average monthly personal radio usage in the year preceding enrolment**

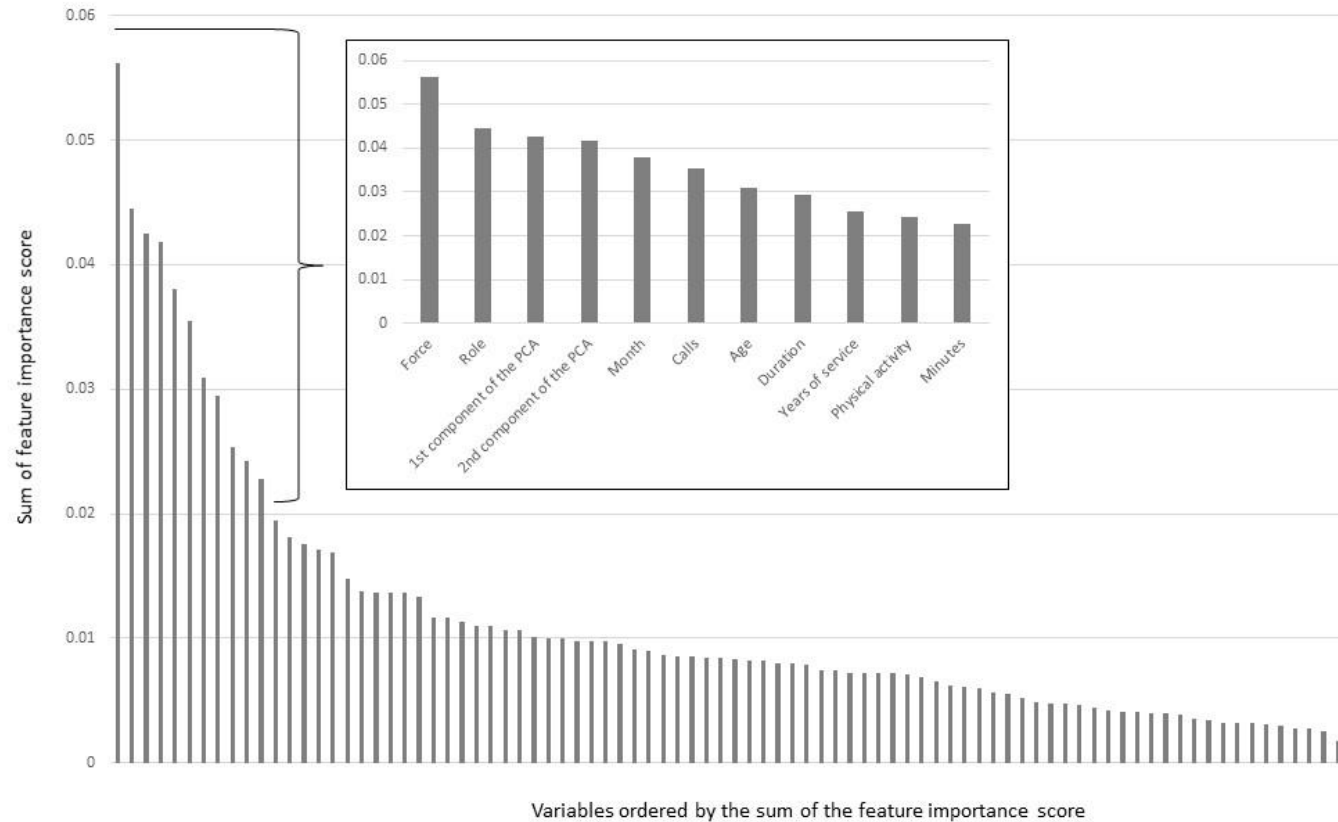


75

76 When using decision trees, as in the gradient boosting regressor model, features used at the top of the tree contribute to the final prediction decision of a larger fraction of the input samples.
 77 The expected fraction of the samples they contribute to can thus be used as an estimate of the relative importance of the features. Those estimates are named feature importances and have been
 78 used in the present study to determine the strongest predictors of the average monthly personal radio usage in the year preceding enrolment. Their values are positive and sum to 1.0. The
 79 higher the value, the more important is the contribution of the feature to the prediction function. This figure shows the feature importance scores for each individual dichotomous predictor.
 80 PCA: Principal Components Analysis.

81

82 **Supplementary Figure 3B. Sum of the feature importance for each variable in the gradient boosting regressor model estimating average**
83 **monthly personal radio usage in the year preceding enrolment**

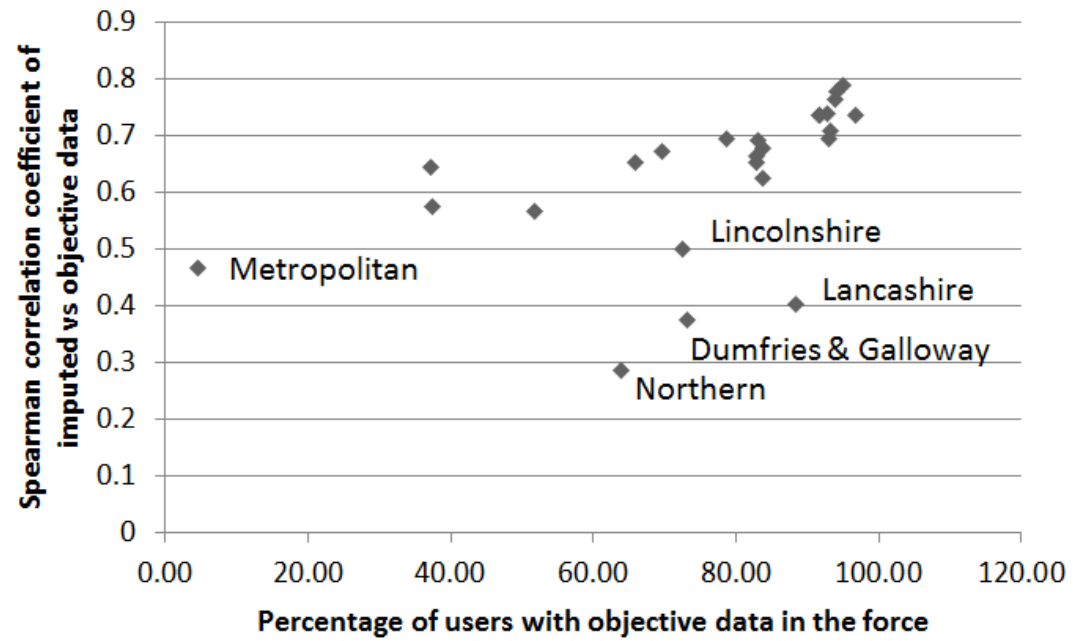


84

85 *When using decision trees, as in the gradient boosting regressor model, features used at the top of the tree contribute to the final prediction decision of a larger fraction of the input samples.*
86 *The expected fraction of the samples they contribute to can thus be used as an estimate of the relative importance of the features. Those estimates are named feature importances and have been*
87 *used in the present study to determine the strongest predictors of the average monthly personal radio usage in the year preceding enrolment. Their values are positive and sum to 1.0. The*
88 *higher the value, the more important is the contribution of the feature to the prediction function. This figure shows the sum of the feature importance scores of all dummy predictors belonging to*
89 *each single variable in order to evaluate the importance of each variable over whole. PCA: Principal Components Analysis*

90

91 **Supplementary Figure 4. Correlation between imputed and objective data among personal radio users according to proportion of**
92 **objective data in each force**
93



94